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MENHADEN EGGS AND LARVAE FROM M/V Theodore N. Gill CRUISES SOUTH ATLANTIC COAST OF THE UNITED STATES, 1953-54

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MENHADEN EGGS AND LARVAE FROM M/V Theodore N. Gill CRUISES, SOUTH ATLANTIC COAST OF THE UNITED STATES, 1953-54

by

John W. Reintjes

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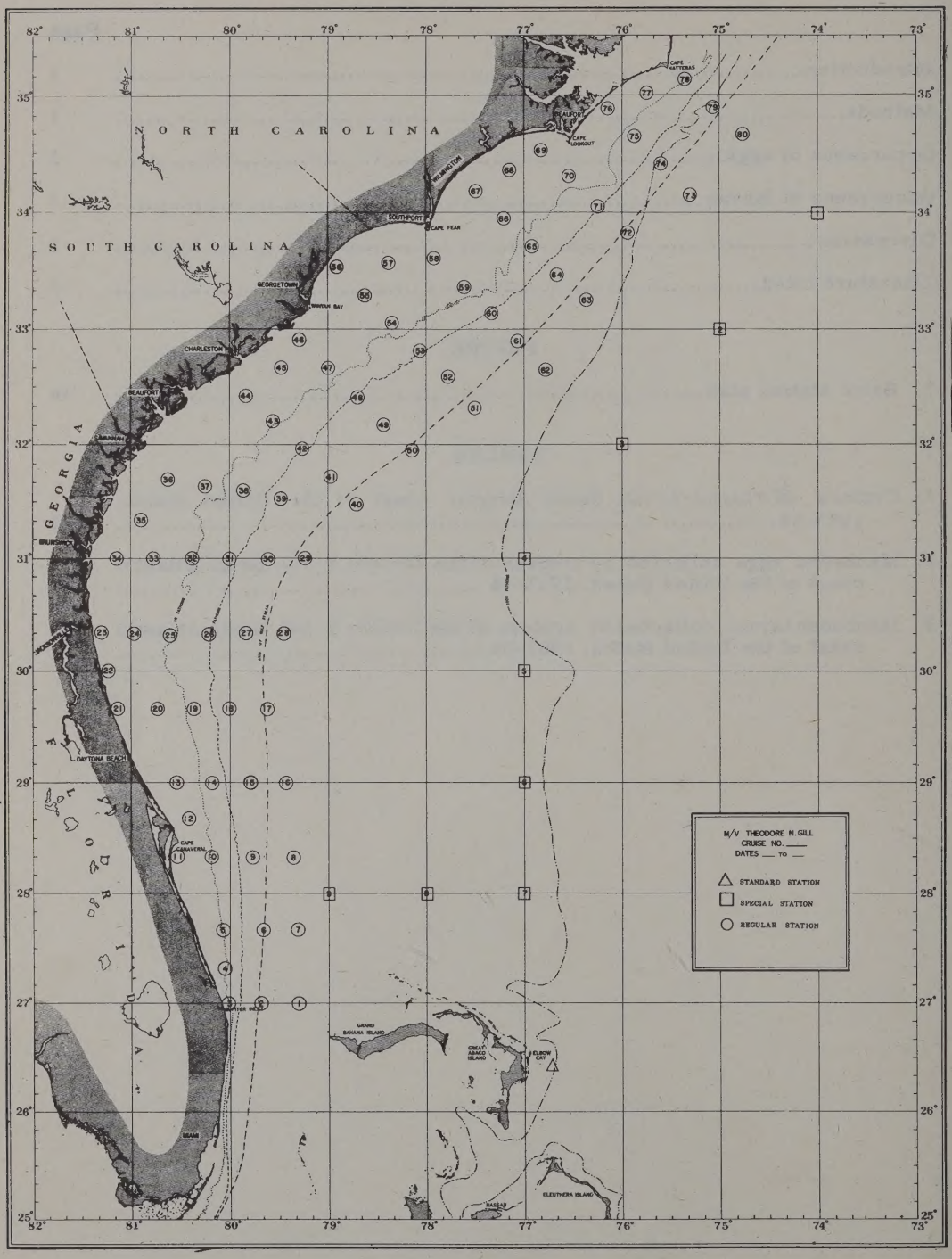

Figure 1.--Basic station plan.

MENHADEN EGGS AND LARVAE FROM M/V Theodore N. Gill CRUISES, SOUTH ATLANTIC COAST OF THE UNITED STATES, 1953-54

by

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ABSTRACT

Menhaden eggs and larvae were collected during the three winter cruises of the Bureau of Commercial Fisheries research vessel *Theodore N. Gill,* but not during the six cruises conducted from late April to November. Eggs and newly hatched larvae occurred principally in the vicinity of Cape Canaveral, Fla., and Cape Lookout, N. C. Older larvae were widely distributed along the coast from Florida to Cape Hatteras, N. C., during February.

INTRODUCTION

Spawning and early larval development of two species of menhaden, the Atlantic menhaden, *Brevoortia tyrannus* (Latrobe), and the yellowfin menhaden, *B. smithi* Hildebrand, are known to occur along the Atlantic coast of the United States. Although adults of both species in a near-spawning condition occur in the coastal waters, and subsequently, well-developed larvae migrate into the estuaries, little is known of the time, place, and extent of spawning or the rate of egg and larval development in the ocean.

Nine cruises of the Bureau of Commercial Fisheries research vessel *Theodore N. Gill,* furnished plankton collections from Cape Hatteras to southern Florida for a 2-year period, 1953-54. The collections offered an opportunity to learn something about the seasonal distribution of menhaden eggs and larvae from their occurrence in the plankton.

I wish to acknowledge the task performed by personnel of the Bureau of Commercial Fisheries Biological Laboratory, Brunswick, Ga. They sorted and counted the fish eggs and larvae and arranged the larvae by taxonomic order or by category based upon morphological similarities. This facilitated my work assignment for which I am grateful. I also wish to acknowledge the contribution of the crew of the *Theodore N. Gill,* and the field personnel that participated in the cruises.

METHODS

The basic station plan for all cruises of the *Gill* is shown in figure 1. Table 1 lists the cruises by date with changes from the basic station plan. In general, stations were run in numerical order from south to north. The physical oceanographic, biological, and chemical data have been presented in a series of published reports (Anderson, Gehringer, and Cohen 1956a and 1956b; Anderson and Gehringer 1957a, 1957b,

TABLE 1.--Cruises of the *Theodore N. Gill,* with unoccupied stations listed by number, South Atlantic coast of the United States 1953-54

Cruise	Dates	Unoccupied stations
1	Feb. 10-Mar. 10, 1953	9, 10, 12-22, 27-31, 63-68, 76, 78-80
2	Apr. 16-May 15, 1953	50-52
3	July 15-Aug. 16, 1953	73, 74, 78-80
4	Oct. 1-Nov. 14, 1953	17, 71-74, 78-80
5	Jan. 20-Feb. 25, 1954	27, 29-32, 45, 57, 60, 72-74, 78-80
[1]6	Apr. 14-29, 1954	18-80
7	June 9-July 13, 1954	75
8	Aug. 27-Oct. 1, 1954	40-42, 76
9	Nov. 3-Dec. 12, 1954	31-34, 64, 73-80

[1] Terminated off Daytona Beach, Fla., due to engine failure.

1958a, 1958b, 1959a, 1959b, and 1959c). Biological methods and procedures, narrative accounts of the cruises, track charts, and other pertinent information were given in those reports.

Identification of specimens occurring in the *Gill* plankton collections was based upon morphological similarity to eggs and larvae of known identity obtained by manually mixing ova and sperm of yellowfin menhaden. Samples of the developing eggs and yolk-sac larvae were preserved at intervals during incubation and early development until absorption of the yolk sac when all survivors died, apparently from lack of food (Reintjes, unpubl. MS.[1]). Older larvae of Atlantic menhaden were collected during their migration into the estuary at Beaufort, N. C., confined in mesh compartments until metamorphosis occurred and positive identification could be made. From these known points of departure, a complete series of menhaden eggs and larvae was assembled. These were used as reference material for the comparative identification of the *Gill* plankton material. No identification to species was made because of the apparent similarity in size and structure of eggs and larvae. Most morphological characteristics overlapped between the species, or at certain stages of development appeared to be identical.

OCCURRENCE OF EGGS

Menhaden eggs occurred in four localities (see table 2): About 25 miles south of Cape Lookout, N. C.; about 40 miles south of Cape Fear, N. C.; in the vicinity of Cape Canaveral, Fla.; and in the vicinity of Jupiter Inlet, Fla.

OCCURRENCE OF LARVAE

Menhaden larvae were collected during the three winter cruises, and the findings are presented in table 3. Small newly hatched larvae (4-9 mm.) occurred in the vicinity of Cape Lookout, N. C., Charleston, S. C., Cape Canaveral, Fla., and the offing of

[1] Development of eggs and yolk-sac larvae of yellowfin menhaden, Bureau of Commercial Fisheries Biological Laboratory, Beaufort, N. C.

TABLE 2.--Menhaden eggs collected on cruises of the *Theodore N. Gill*, South Atlantic coast of the United States, 1953-54

Cruise	Station	Date	Area and location	No. of menhaden eggs	Estimated hours since fertilization
			Jupiter Inlet, Fla.		
1	3	Feb. 17, 1953	lat. 27°00' N., long. 80°03'30" W.	9	24 and 48
1	4	Feb. 17, 1953	lat. 27°20' N., long. 80°03' W.	150	24
1	5	Feb. 17, 1953	lat. 27°40' N., long. 80°03' W.	500	24
5	[2] H.S. 4	Jan. 30, 1954	lat. 27°28' N., long. 80°04' W.	4	40
			Cape Canaveral, Fla.		
5	H.S. 10	Feb. 2, 1954	lat. 29°01' N., long. 79°59' W.	20	40
5	10	Feb. 1, 1954	lat. 28°19' N., long. 80°12' W.	3	24
5	14	Feb. 2, 1954	lat. 29°00' N., long. 80°10' W.	2000	48
5	15	Feb. 2, 1954	lat. 29°00' N., long. 79°48' W.	2	30 and 40
			Cape Fear, N. C.		
5	59	Feb. 17, 1954	lat. 33°22' N., long. 77°36' W.	1	30
			Cape Lookout, N. C.		
5	68	Feb. 20, 1954	lat. 34°22' N., long. 77°09' W.	27	48
5	70	Feb. 22, 1954	lat. 34°18' N., long. 76°26' W.	5	36
9	70	Dec. 8, 1954	lat. 34°18' N., long. 76°32' W.	47	48

[1] Based on the observed development rate of yellowfin menhaden eggs (Reintjes, unpubl. MS., see p. 5).
[2] H.S. = high speed tows made between regular stations with Gulf 1A sampler (Arnold and Gehringer, 1952).

Jacksonville Beach, Fla. Larger larvae (10-22 mm.) occurred in 11 collections during cruise 1 (Feb. 10-Mar. 10) in nearly half of the collections taken during cruise 5 (Jan. 20-Feb. 25), and in one collection at the end of cruise 9 (Dec. 10).

DISCUSSION

The occurrence of menhaden eggs and small larvae in the collections from the three winter cruises (1, 5, and 9) and their absence during the six cruises (2, 3, 4, 6, 7, and 8) conducted from late April to November furnished evidence that menhaden spawn along the south Atlantic coast generally from December to February. Furthermore, the principal spawning areas may be limited to certain localities, namely, Cape Lookout and Cape Canaveral to Jupiter Inlet. Based on the known distribution of juvenile and adult menhaden (Hildebrand, 1948; June, 1958; and Reintjes, 1960), the eggs and larvae encountered in the vicinity of Cape Lookout may be those of Atlantic menhaden, while those encountered between Cape Canaveral and Jupiter Inlet, may be those of yellowfin menhaden. Incubation and absorption of the yolk sac is accomplished in 1 week or less, hence there probably is relatively little drift from the immediate vicinity of spawning. The scarcity of eggs in the collections thus might be due to their limited distribution and brief existence.

Larvae were more widely distributed due to a longer period of exposure to transporting currents and their ability to swim. Although the elapsed time from absorption of the yolk sac to time of entry into an estuary is unknown, between 1 and 3 months is indicated by observations of subsequent growth within the estuary. (Chamberlin,

TABLE 3.--Menhaden larvae collected on cruises of the *Theodore N. Gill* South Atlantic coast of the United States, 1953-54

Cruise	Station	Date	Area and location	No. of larvae	Size range in mm. S.L.[1]
			Savannah, Ga. to Georgetown, S. C.		
1	37	Feb. 27, 1953	lat. 31°36' N., long. 80°10' W.	3	14-15
1	38	Feb. 27, 1953	lat. 31°31' N., long. 79°52' W.	3	10-14
1	43	Feb. 28, 1953	lat. 32°12' N., long. 79°32' W.	1	17
1	44	Feb. 28, 1953	lat. 32°25' N., long. 79°50' W.	7	15-17
1	45	Feb. 28, 1953	lat. 32°40' N., long. 79°32' W.	3	13-16
1	46	Feb. 28, 1953	lat. 32°51' N., long. 79°18' W.	5	13-16
1	47	Feb. 28, 1953	lat. 32°40' N., long. 79°00' W.	2	13-15
			Cape Fear, N. C.		
1	57	Mar. 3, 1953	lat. 33°34' N., long. 78°24' W.	1	19
1	60	Mar. 3, 1953	lat. 33°08' N., long. 77°20' W.	2	10-15
			Cape Lookout, N. C.		
1	71	Mar. 6, 1953	lat. 34°03' N., long. 76°15' W.	4	9-12
1	74	Mar. 7, 1953	lat. 34°25' N., long. 75°26' W.	3	12-13
			Indian River, Fla. to Cape Hatteras, N. C.		
5	H.S. 7	Feb. 1, 1954	lat. 28°27' N., long. 80°23' W.	2	16-17
5	H.S. 8	Feb. 1, 1954	lat. 28°49' N., long. 80°26' W.	1	16
5	H.S. 9	Feb. 1, 1954	lat. 28°59' N., long. 80°20' W.	3	11-12
5	11	Feb. 1, 1954	lat. 28°20' N., long. 80°32' W.	58	15-17
5	14	Feb. 2, 1954	lat. 29°00' N., long. 80°10' W.	500	4-9
5	H.S. 18	Feb. 5, 1954	lat. 30°20' N., long. 81°07' W.	4	11-21
5	19	Feb. 4, 1954	lat. 29°40' N., long. 80°23' W.	1000	4-12
5	H.S. 19	Feb. 10, 1954	lat. 31°01' N., long. 80°56' W.	4	18-20
5	H.S. 20	Feb. 10, 1954	lat. 31°12' N., long. 81°03' W.	2	18-20
5	H.S. 21	Feb. 10, 1954	lat. 31°29' N., long. 80°45' W.	1	20
5	H.S. 22	Feb. 10, 1954	lat. 31°39' N., long. 80°25' W.	1	20
5	H.S. 23	Feb. 10, 1954	lat. 31°37' N., long. 80°03' W.	1	21
5	24	Feb. 5, 1954	lat. 30°20' N., long. 80°59' W.	7	6-19
5	25	Feb. 5, 1954	lat. 30°20' N., long. 80°34' W.	39	5-14
5	H.S. 25	Feb. 14, 1954	lat. 32°06' N., long. 79°27' W.	20	11-18
5	H.S. 30	Feb. 15, 1954	lat. 32°31' N., long. 78°53' W.	100	10-15
5	H.S. 31	Feb. 15, 1954	lat. 32°48' N., long. 79°06' W.	14	12-22
5	H.S. 32	Feb. 15, 1954	lat. 33°10' N., long. 79°01' W.	1	20

See footnote at end of table.

TABLE 3.--Menhaden larvae collected on cruises of the *Theodore N. Gill* South Atlantic coast of the United States, 1953-54 (continued)

Cruise	Station	Date	Area and location	No. of larvae	Size range in mm. S.L.[1]
			Indian River, Fla. to Cape Hatteras, N. C.		
5	34	Feb. 10, 1954	lat. 31°00' N., long. 81°09' W.	1	21
5	H.S. 35	Feb. 16, 1954	lat. 32°57' N., long. 78°13' W.	31	12-14
5	H.S. 37	Feb. 16, 1954	lat. 32°25' N., long. 77°41' W.	2	10-15
5	38	Feb. 11, 1954	lat. 31°36' N., long. 79°51' W.	4	13-15
5	H.S. 41	Feb. 22, 1954	lat. 34°13' N., long. 76°21' W.	20	15-18
5	H.S. 42	Feb. 22, 1954	lat. 34°47' N., long. 76°01' W.	1	17
5	H.S. 43	Feb. 22, 1954	lat. 34°58' N., long. 76°04' W.	1	15
5	43	Feb. 14, 1954	lat. 32°12' N., long. 79°33' W.	50	8-12
5	47	Feb. 15, 1954	lat. 32°40' N., long. 79°00' W.	32	9-12
5	54	Feb. 16, 1954	lat. 33°03' N., long. 78°21' W.	100	10-15
5	55	Feb. 16, 1954	lat. 33°18' N., long. 78°38' W.	37	10-22
5	56	Feb. 16, 1954	lat. 33°32' N., long. 78°55' W.	1	15
5	59	Feb. 17, 1954	lat. 33°22' N., long. 77°36' W.	1	17
5	61	Feb. 17, 1954	lat. 32°54' N., long. 77°03' W.	30	11-18
5	62	Feb. 17, 1954	lat. 32°38' N., long. 76°49' W.	37	12-17
5	63	Feb. 21, 1954	lat. 33°15' N., long. 76°22' W.	36	12-14
5	66	Feb. 20, 1954	lat. 33°57' N., long. 77°13' W.	5	13-15
5	67	Feb. 17, 1954	lat. 34°11' N., long. 77°29' W.	1	14
5	70	Feb. 22, 1954	lat. 34°18' N., long. 76°26' W.	1	15
5	76	Feb. 23, 1954	lat. 34°53' N., long. 76°09' W.	2	14-15
5	77	Feb. 23, 1954	lat. 35°01' N., long. 75°44' W.	3	14-19
			Cape Canaveral, Fla.		
9	11	Nov. 17, 1954	lat. 28°20' N., long. 80°33' W.	51	6-9
			Cape Lookout, N. C.		
9	67	Dec. 10, 1954	lat. 34°11' N., long. 77°29' W.	54	6-18
9	70	Dec. 8, 1954	lat. 34°18' N., long. 76°32' W.	22000	4-5

[1] Standard length from the tip of the snout to the end of the vertebral column.

Pacheco, Grant, and Carlson, unpub. MS.[2]).

The greater number of collections containing menhaden larvae during cruise 5 than during cruise 1, both of which occurred during the same time of year, is believed due to the changes in methods of collecting. During cruise 1, a half-meter silk plankton net was towed slowly at an estimated speed of 1-2 knots. During cruise 5, metal plankton nets were towed more rapidly. A Gulf III sampler was towed at 5-6 knots for all but seven of the regular stations occupied, and a Gulf 1A sampler was towed between stations 1 to 43 at 8-10 knots. A description of the samplers is given by Arnold and Gehringer (1952). The absence or scarcity of larvae during cruise 1 is believed due to their ability to avoid a slow-moving net.

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